PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 80799F	**FOR FURTHER ACTION** See Form PCT/IPEA/416	
International application No. PCT/FI2005/000129	International filing date *(day/month/year)* 28-02-2005	Priority date *(day/month/year)* 27-02-2004
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant Tameye Oy et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 10 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☒ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23-12-2005	28-04-2006
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Anna Lundqvist /LR Telephone No. +46 8 782 25 00

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of: Cover sheet

International patent classification (IPC)
G01N 21/89 (2006.01)
G01N 33/00 (2006.01)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/FI2005/000129

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____ ,
which is the language of a translation furnished for the purposes of:

☐ international search (Rules 12.3(a) and 23.1(b))

☐ publication of the international application (Rule 12.4(a))

☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 1-24 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* 26-35 received by this Authority on 24-04-2006

pages* _____ received by this Authority on _____

☒ the drawings:

pages 1-8 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-37	YES
	Claims		NO
Inventive step (IS)	Claims	1-37	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-37	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The application deals with a method for coding a place in an analyzable material according to a wavelength. The spectrums reflected from the surface are collected and compared to a predetermined reference spectrum.

Reference is made to the following documents:
D1: US 2003222219 A1
D2: US 6573998 B2
D3: US 4675730 A

Document D1 describes a method for controlling a moisture profile of a moving paper web during manufacture. The light is directed to the paper web with optical fibres and the radiation reflected from the paper web is forwarded with other optical fibres to a spectrometer. The spectrometer is an imaging spectrometer, i.e. it images the spectrum of a measuring point. There is a reference unit, also used for calibration. See for instance [0027]-[0032] and figures 2 and 5.

Document D2 describes an optoelectronic system using spatiochromatic triangulation for determining a three-dimensional topography of an object. A broad range of wavelengths is used and the spectrums are recorded by a spectrograph. The light from the light source pass a dispersing element prior to illuminating a measuring space. See for example column 3, lines 4 - 13 and lines 51-60; column 4, lines 56-67 and figure 1.

The method for controlling a moisture profile of a moving paper web described in D1 is considered to be the closest prior art. The technique mentioned in claims 1, 15, 30 and 41

.../...

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of: Box V

differs from this in that it has a dispersing element producing a spectrum on the surface to be investigated. The problem solved by this difference is to be able to analyze a grater area on a surface.

Since none of these documents include the amendment of the independent claims, namely an arrangement where the light is dispersed on the material as overlapping spectrums in a first and a second direction such that the first and the second direction are essentially perpendicular on one another and that the spectrums dispersed in the first and the second direction are formed of different wavelength areas, they only represents prior art.

The subject-matter of claims 1-37 meet the requirements of the PCT with respect to novelty and inventive step. The invention is industrially applicable.

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

For example claims 13-21 is directed to "any of the preceding claims". Since claims 13-21 refers to a system, they should not direct to the method described in claim 1, but rather to the independent system claim 11. It is the same thing with claims 24-30 and 34-37. Claim 32 should presumably direct to claim 31.

PCT / FI 2005 / 0 0 0 1 2 9
24 -04- 2006

CLAIMS

1. A method for indicating a deviation in an analyzable material according to a wavelength, characterized in that the method comprises:

dispersing the light produced by a light source to the surface of the analyzable moving planar material as overlapping spectrums in a first and a second direction such that the first and the second direction are essentially perpendicular to one another and that the spectrums dispersed in the first and the second direction are formed of different wavelength areas ;

collecting the spectrums reflected from the surface of the analyzable moving planar material with at least one lens to a focal point;

guiding the spectrums collected to the focal point by at least one optic fibre into a spectrum camera;

comparing the spectrums guided into the spectrum camera to a predetermined reference spectrum; and

defining the location of one or more deviations in the analyzable material on the basis of the comparison.

2. A method according to claim 1, characterized in that the method uses a set of measurement modules, each one of which contains the necessary optic components, wherein the method comprises:

guiding the light produced by the light source by the first connection into each measurement module;

dispersing the light produced by the light source to the surface of the analyzable material as overlapping spectrums in a first and a second direction such that using the light dispersed through each measurement module a particular portion of the area to be analyzed is covered;

collecting the spectrums reflected from the surface of the analyzable material with the lens of each measurement module to the focal point of the lens; and

PCT / FI 2005 / 0 0 0 1 2 9
24 -04- 2006

guiding the spectrums collected to the focal point into a spectrum camera by at least one optic fibre.

3. A method according to claim 2, characterized in that the method further comprises a step of: moving the measurement bar, to which is attached a set of measurement modules.

4. A method according to any of the preceding claims, characterized in that the analyzable material is wood, paper, fabric, metal or plastic.

5. A method according to any of the preceding claims, characterized in that the method further comprises the steps of:

analyzing the data gathered by the spectrum camera; and

defining the location of a deviation in the analyzed material on the basis of spatial and spectral components of the pixel of the spectrum camera.

6. A method according to any of the preceding claims, characterized in that measurement is calibrated according to the light source such that:

the reference point of the analyzable material is lit directly without dispersing the light produced by the light source as at least one spectrum;

collecting a reference spectrum from the light reflected from the surface of the reference point of the analyzable material; and

defining a spectral distribution of the light source from the reference spectrum.

7. A method according to any of the preceding claims, characterized in that measurement is calibrated according to the light source such that:

dispersing the light produced by the light source as several spectrums to the surface of the reference point of the analyzable material;

collecting a reference spectrum from the light reflected from the surface of the reference point of the analyzable material; and

defining a spectral distribution of the light source from the reference spectrum.

8. A method according to claim 7 or 8, characterized in that the reference spectrum is averaged and/or median filtered on the basis of new spectral measurements.

9. A method according to any of the preceding claims, characterized in that the dispersion of the light is achieved with at least one prism and/or grating.

10. A method according to any of the preceding claims, characterized in that the collection of the spectrums is achieved with a cylinder lens.

11. A system for indicating a deviation in an analyzable material according to a wavelength, characterized in that the system comprises:

an analyzable moving planar material (102, 200);

at least one light source (10);

at least one spectrum camera (16);

means (234, 236) for dispersing the light produced by the light source (10) to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that the first and the second direction are essentially perpendicular to one another and that the spectrums dispersed in the first and the second direction are formed of different wavelength areas;

means (238) for collecting the spectrums reflected from the surface of the analyzable moving planar material with at least one lens to a focal point;

means (226, 242) for guiding the spectrums collected to the focal point into the at least one spectrum camera (16);

means (106) for comparing the spectrums guided into the spectrum camera to a predetermined reference spectrum; and

means (106) for defining the location of one or more deviations in the analyzable material on the basis of comparison.

12. A system according to claim 11, c h a r a c t e r i z e d in that the system comprises a set of measurement modules, and that:

each measurement module comprises a first connection (240, 244), with which the light produced by the light source (10) is guided into each measurement module;

each measurement module comprises means (234, 236) for dispersing the light produced by the light source to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that using the light dispersed through each measurement module a particular portion of the area to be analyzed is covered;

each measurement module comprises means (238) for collecting the spectrums reflected from the surface of the analyzable material to the focal point of the lens contained in each measurement module; and

each measurement module comprises a second connection (242), to which is connected at least one optic fibre (226) which is arranged to connect the measurement module to the at least one spectrum camera (16) for guiding the spectrums collected to the focal point into the at least one spectrum camera (16).

13. A system according to any of the preceding system claims, c h a r a c t e r i z e d in that the measurement module (218) comprises the first orientation means, with which the means (234, 236) for dispersing are oriented to disperse the light produced by the light source (10) as a spectrum to the desired area surface of the analyzable material (102, 200).

14. A system according to any of the preceding system claims, characterized in that the measurement module (218) comprises the second orientation means, with which the means (238) for collecting are oriented to collect the spectrum reflected from the analyzable material (102, 200) from the desired area of the material (102, 200).

15. A system according to any of the preceding system claims, characterized in that the system further comprises a measurement bar (100), to which the measurement modules (218) are attached.

16. A system according to any of the preceding system claims, characterized in that the system further comprises means for moving the measurement bar (100).

17. A system according to any of the preceding system claims, characterized in that the analyzable material (102, 200) is wood, paper, fabric, metal or plastic.

18. A system according to any of the preceding system claims, characterized in that the data processing device (106) is arranged to analyze the data gathered by the spectrum camera (16) and define the location of a deviation in the analyzed material (102, 200) on the basis of the spatial and spectral components of the pixel of the spectral camera (16).

19. A system according to any of the preceding system claims, characterized in that the system further comprises means for locating dispersion means (110) to the side such that the analyzable material is lit directly for measurement of a reference spectrum from the reference point of the analyzable material.

20. A system according to any of the preceding system claims, characterized in that

PCT / FI 2005 / 0 0 0 1 2 9
24 -04- 2006

the means (234, 236) for dispersing the light comprises at least one prism and/or grating.

21. A system according to any of the preceding system claims, characterized in that the means (238) for collecting the spectrums comprise a cylinder lens.

22. A measurement bar for analyzing the material, characterized in that the measurement bar (100) comprises at least one measurement module (218); each measurement module comprises:

means (234, 236) for dispersing the light produced by the light source (10) to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that the first and the second direction are essentially perpendicular to one another and that the spectrums dispersed in the first and the second direction are formed of different wavelength areas;

means (108, 238) for collecting the spectrums reflected from the surface of the analyzable moving planar material (102, 200) with at least one lens contained in each measurement module to a focal point; and

means (226, 242) for guiding the spectrums collected to the focal point into the at least one spectrum camera (16).

23. A measurement bar according to claim 22, characterized in that each measurement module (18) comprises:

a first connection (240, 244), with which the light produced by the light source (10) is guided into each measurement module;

means (234, 236) for dispersing the light produced by the light source to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that using the light

dispersed through each measurement module a particular portion of the area to be analyzed is covered;

means (238) for collecting the spectrums reflected from the surface of the analyzable material to the focal point of the lens contained in each measurement module; and

a second connection (242), to which is connected at least one optic fibre (26) which is arranged to connect the measurement module to the spectrum camera (16) for guiding the spectrums collected to the focal point into the spectrum camera (16).

24. A measurement bar according any of the preceding measurement bar claims, c h a r a c t e r - i z e d in that the measurement bar (100) is arranged to be moveable.

25. A measurement bar according any of the preceding measurement bar claims, c h a r a c t e r - i z e d in that the measurement bar (100) is arranged above the analyzable material.

26. A measurement bar according any of the preceding measurement bar claims, c h a r a c t e r - i z e d in that the measurement module (218) comprises means for locating dispersion means (110) to the side such that the analyzable material is lit directly for measurement of a reference spectrum from the reference point of the analyzable material.

27. A measurement bar according any of the preceding measurement bar claims, c h a r a c t e r - i z e d in that the measurement module (218) comprises the first orientation means, with which the means (234, 236) for dispersing are oriented to disperse the light produced by the light source (10) as a spectrum to the desired area surface of the analyzable material (102, 200).

28. A measurement bar according to any of the preceding measurement bar claims, c h a r a c t e r - i z e d in that the measurement module (218) comprises

the second orientation means, with which the means (238) for collecting areoriented to collect the spectrum reflected from the analyzable material (102, 200) from the desired area of the material (102, 200).

29. A measurement bar according any of the preceding measurement bar claims, characterized in that the means (234, 236) for dispersing the light comprise at least one prism and/or grating.

30. A measurement bar according to any of the preceding measurement bar claims, characterized in that the means (108, 238) for collecting the spectrums comprise a cylinder lens.

31. A measurement module for analyzing the material, characterized in that the measurement module (218) comprises:

means (234, 236) for dispersing the light produced by the light source (10) to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that the first and the second direction are essentially perpendicular to one another and that the spectrums dispersed in the first and the second direction are formed of different wavelength areas;

means (108, 238) for collecting the spectrums reflected from the surface of the analyzable moving planar material (102, 200) with at least one lens contained in each measurement module to a focal point; and

means (226, 242) for guiding the spectrums collected to the focal point into at least one spectrum camera (16).

32. A measurement module according to claim 33, characterized in that the measurement module (218) comprises:

a first connection (240, 244), with which the light produced by the light source (10) is guided into each measurement module;

means (234, 236) for dispersing the light produced by the light source to the surface of the analyzable material (102, 200) as overlapping spectrums in a first and a second direction such that using the light dispersed through each measurement module a particular portion of the area to be analyzed is covered;

means (238) for collecting the spectrums reflected from the surface of the analyzable material to the focal point of the lens contained in each measurement module; and

a second connection (242), to which is connected at least one optic fibre (26) which is arranged to connect the measurement module to the spectrum camera (16) for guiding the spectrums collected to the focal point into the spectrum camera (16).

33. A measurement module according to claim 32, c h a r a c t e r i z e d in that the measurement module (218) comprises means for locating dispersion means (110) to the side such that the analyzable material is lit directly for measurement of a reference spectrum from the reference point of the analyzable material.

34. A measurement module according to any of the preceding measurement module claims, c h a r a c t e r i z e d in that the measurement module (218) comprises first orientation means, with which the means (234, 236) for dispersing are oriented to disperse the light produced by the light source (10) as a spectrum to the desired area surface of the analyzable material (102, 200).

35. A measurement module according to any of the preceding measurement module claims, c h a r a c t e r i z e d in that the measurement module (18) comprises the second orientation means, with which the means (238) for collecting are oriented to collect the spectrum reflected from the analyzable material (102, 200) from the desired area of the material (102, 200).

PCT / FI 2005 / 0 0 0 1 2 9
24 -04- 2006

36. A measurement module according to any of the preceding measurement module claims, c h a r a c - t e r i z e d in that the means (234, 236) for dispersing the light comprise at least one prism and/or grating.

37. A measurement module according to any of the preceding measurement module claims, c h a r a c - t e r i z e d in that the means (108, 238) for collecting the spectrums comprise a cylinder lens.